

14. In a liquid crystal display device according to claim 12, wherein a relationship between a distance l between said pixel electrode and said common electrode and a distance d between said pair of substrates is  $l/d \geq 2.0$ .

15. In a liquid crystal display device according to claim 12, wherein a relation between an elasticity constant K2 and a dielectric anisotropy  $\Delta\epsilon$  of said liquid crystal composite material satisfies the relation

$K2/\Delta\epsilon < 9 \times 10^{-8}[\text{dyn}]$ .--

#### REMARKS

By the above amendment, the specification has been updated in reference to the parent patent, claim 1 has been amended to further define the structure of the display device, claim 3 has been written in independent form and independent claim 4 has been amended to correct an apparent error therein. Further, dependent claims have been presented which depend upon independent claim 4 and recite further features of the present invention. Additionally, new independent claims 8 and 12 have been presented, reciting "In a liquid crystal display device" of a particular structure, a liquid crystal composite having particular properties. Insofar as the Examiner contends that the use of the composite is given little weight in terms of the claimed subject matter drawn to a composition, at least with respect to newly presented independent claims 8

OK  
In new  
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and 12, the structure must be given patentable weight together with the composition, with new dependent claims 9-11 and 13-15 being presented, dependent from independent claims 8 and 12, respectively.

With respect to the provisional rejection of claims 1-5 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 4, 16 and 25 of copending application Serial No. 08/405,887, it is noted that such copending application has now issued as U.S. Patent No. 6,011,606, and the status thereof has been updated in this application. In order to eliminate such rejection, submitted herewith is a Terminal Disclaimer and the appropriate fee therefor.

Turning to the rejection of claims 1 and 3-5 under 35 U.S.C. §103(a) as being unpatentable over Jubb et al, U.S. Patent No. 5,698,134, and the rejection of claims 1-5 under 35 U.S.C. §103(a) as being unpatentable over Nolan et al, U.S. Patent No. 5,498,365, such rejections are traversed insofar as they are applicable to the present claims.

At the outset, it is noted that in setting forth the rejections, the Examiner contends that the "use of the composite is given little weight" (emphasis added). Applicants submit that this position by the Examiner is in error, noting that 35 U.S.C. §100 and 35 U.S.C. §101 indicates that the classes of invention includes a new use of a known process, machine, manufacture, composition of matter, or

material, and that whoever invents or discovers any new and useful process, machine, manufacture, composition of matter, or any new and useful improvement thereof, may be obtain a patent therefor. Thus, applicants submit that insofar as the Examiner contends that the use of the composite in a particular liquid crystal display device, as defined, is given little weight, applicants submit that such position is improper.

Referring to the specification of this application, it is noted that the present invention relates to an active matrix type liquid crystal display apparatus, in which an electric field is applied, mainly parallel to the substrates, and in which a broad visual field and a large numerical aperture are realized. More particularly, page 1, lines 13-20, describes the conventional liquid crystal display apparatus in which the electrodes for driving the liquid crystal layer are formed on the surfaces of two opposing substrates, in which the liquid crystal layer is driven by applying an electric field in a direction vertical to the surface of the substrate, and what is referred to as a twisted nematic display method (TN method).

As described, irrespective of the operation of the conventional active matrix type liquid crystal display apparatus typically using the twisted nematic method, the present invention is directed to a different type of apparatus utilizing a horizontal electric field method or as recited in

the claims of this application, an electrode structure for generating an electric field having a component predominantly in parallel with one of the pair of substrates. In such structure, in order to realize a large numerical aperture as described at pages 2 and 3 of the Office Action, it is necessary to enlarge the gap between the electrodes and a problem arises due to the enlargement of the gap in that a disturbance of the orientation occurs due to static electricity because the volume of the liquid crystal decreases and due to the differences in configuration of the electrode structure, for generating a horizontal or parallel electric field as opposed to the vertical electric field of the conventional construction, the volume of the liquid crystal is not large and if such volume becomes smaller by enlarging the gap between the electrodes, the liquid crystal is susceptible to the effects of static electricity and the disturbance of the orientation due to static electricity increases.

Additionally, if the gap between the electrodes becomes large, a problem arises in that the display method driven by the electric field requires a large drive voltage. As pointed out in the specification of this application, at page 10, lines 9-13, "In the conventional active matrix type liquid crystal display apparatus, it is required to use a liquid crystal with a high resistivity of at least  $1 \times 10^{13} \Omega \cdot \text{cm}$ , preferably,  $1 \times 10^{14} \Omega \cdot \text{cm}$ , in order to apply a sufficient voltage even during a non-selected period of time." (emphasis added) As

further described, the utilization of such high resistivity presents problems when utilized in a liquid crystal display device of the present invention, wherein an electric field having a component predominantly in parallel with one of the pair of substrates is generated. Accordingly, applicants have determined a suitable range of values of resistivity for the horizontal field liquid crystal display device, which enable proper display and which values of resistivity are contrary to the requirements of resistivity of the conventional liquid crystal display device. Furthermore, as described at page 11 of the specification of this application, applicants have also determined a relationship between the dielectric anisotropy ( $\Delta\epsilon$ ) of the liquid crystal composite material and the elasticity constant ( $K_2$ ) of the twist, which enables proper display in the liquid crystal display device of the present invention having an electrode structure which generates an electric field having a component predominantly in parallel with one of the pair of substrates and which differs from the prior art. Applicants submit that these features and properties of the liquid crystal composition are clearly set forth in the independent and dependent claims of this application, and such features cannot be disregarded and are not disclosed or taught in the cited art, as will become clear from the following discussion.

Turning first to the Jubb reference, the Examiner acknowledges differences between Jubb et al and the claimed

invention, including (A) "The difference between the reference and the application is that the reference does not state the composite material is for use in a display device having electrode structure for generating an electric field having a component predominantly in parallel with one of the pair of substrates."; (B) "The reference also does not state that the relationship between elastic constant and the dielectric anisotropy is  $< 9 \times 10^{-8}$  dyn"; or (C) That the resistivity of the composite material is between  $1 \times 10^{13}$  and  $1 \times 10^9$  ohm.m." It is noted that by the present amendment, claim 4 has been amended to utilize appropriate units of " $\Omega \cdot \text{cm}$ " rather than " $\Omega \text{cm}$ ". With respect to the features (A), (B) and (C), the Examiner contends that "the same compounds would be expected to exhibit the same features". It is noted that the Examiner has provided the same reasoning in relation to the patent to Nolan et al.

As to the Examiner's contention concerning feature (A), applicants submit that both Jubb et al and Nolan et al, irrespective of the disclosed liquid crystalline composition, disclose that the invention thereof relates to an electro-optical system of the conventional liquid crystal display device of the vertical electric field type in which the liquid crystal mixture, as disclosed, is provided "between two electrode layers". See, for example, claim 1 of each of such patents and the abstract thereof. The provision of a liquid crystal layer between two electrodes which are formed on

opposing substrates represents the conventional liquid crystal display device, as described in the specification of this application, which utilizes a vertical electric field. Thus, there is no disclosure or teaching in Jubb et al or Nolan et al of the utilization of the claimed liquid crystal mixture in a liquid crystal display device having an electrode structure for generating an electric field having a component predominantly in parallel with one of the pair of substrates, as recited in each of the independent claims of this application. Moreover, the structure of the electro-optical system of both such patents do not utilize the pixel electrode and a common electrode forming such electrode structure, and there is no disclosure or teaching in such patents of the relationship between distance between the pixel electrode and the common electrode and the distance between the pair of substrates, as now recited in claim 1 and other claims of this application. Thus, while the Examiner apparently contends that the feature of the liquid crystal display device is given little weight, such feature represents a claimed feature and all features of the claim must be considered, noting that such claimed feature is contrary to that disclosed in Jubb et al and Nolan et al, with the other feature as now set forth in the claims in relation to feature (A) and features (B) and (C) are not disclosed or taught in the cited art. As such, all claims should be considered allowable thereover.

With respect to feature (B) and feature (C), it is

apparent that such features, as recognized by the Examiner, are not disclosed or taught in the cited art, with the Examiner suggesting that such features would be expected. This position by the Examiner is contrary to the disclosure of this application, and applicants submit that the Examiner is engaging in the principal of "obvious to try" which is not the standard of 35 U.S.C. §103. Reference is made to the decision of In re Fine, 5 USPQ 2d 1596 (Fed. Cir. 1988), wherein the court pointed out that the PTO has the burden under §103 to establish a prima facie case of obviousness and can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. As noted by the court, whether a particular combination might be "obvious to try" is not a legitimate test of patentability and obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. As further noted by the court, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

Applicants submit that the specification of this application clearly points out that the resistivity and the relationship concerning elastic constant and dielectric anisotropy represent properties which are contrary to the



conventional liquid crystal display utilization and are not disclosed or taught in the cited art. Further, the now recited relationship of distance between pixel electrode and common electrode and distance between the pair of substrates, is also not disclosed or taught in the cited art. Thus, applicants submit that each of the independent and dependent claims patentably distinguish over Jubb et al and Nolan et al in the sense of 35 U.S.C. §103, and should be considered allowable thereover.

Insofar as the Examiner has failed to give consideration to the use of the liquid crystal composite material in the liquid crystal display device, as claimed, it is noted that new independent claims 8 and 11 and the dependent claims thereof recite the feature that the liquid crystal composite material is in a liquid crystal display device of the claimed features, and such features cannot be ignored. These claims also patentably distinguish over the cited art for the reasons given above.

In view of the above amendments and remarks, applicants submit that all claims present in this application patentably distinguish over the cited art, and should now be in condition for allowance. Accordingly, issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this

paper, including extension of time fees, to Deposit Account  
No. 01-2135 (503.33612CX1) and please credit any excess fees  
to such deposit account.

Respectfully submitted,



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